1. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

   Pringles wants to add 31 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

   A. About 9 percent

   B. About 3 percent

   C. About 16 percent

   D. About 14 percent

   E. None of the above

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2. Solve the modeling problem below, if possible.

   A new virus is spreading throughout the world. There were initially 5 many cases reported, but the number of confirmed cases has doubled every 3 days. How long will it be until there are at least 100000 confirmed cases?

   A. About 43 days

   B. About 14 days

   C. About 30 days

   D. About 15 days

   E. There is not enough information to solve the problem.

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3. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 190° *C and is placed into a* 15° *C bath to cool. After 28 minutes, the uranium has cooled to* 130° *C.*

A. $k = -0.01793$

B. $k = -0.02749$

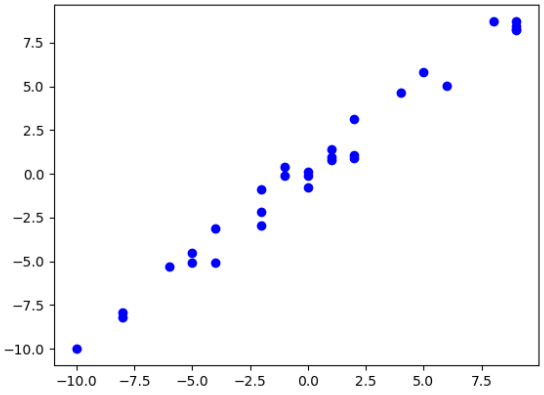
C. $k = -0.04570$

D. $k = -0.02713$

E. None of the above

---

4. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Exponential model

C. Logarithmic model

D. Linear model

E. None of the above

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5. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 38 percent more chips to their cylinder cans

and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

A. About 11 percent

B. About 19 percent

C. About 3 percent

D. About 17 percent

E. None of the above

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6. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 29 liter 23 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 19 percent and 43 percent solutions, what was the amount she used of the 43 percent solution?

A. $20.16 liters$

B. $14.50 liters$

C. $4.83 liters$

D. $24.17 liters$

E. There is not enough information to solve the problem.

---

7. Using the situation below, construct a linear model that describes the cost of the coffee beans $C(h)$ in terms of the weight of the high-quality coffee beans h.

Veronica needs to prepare 210 of blended coffee beans selling for \$5.34 per pound. She has a high-quality bean that sells for \$6.02 a pound and a low-quality bean that sells for \$4.47 a pound.

A. $C(h) = 6.02h$

B. $C(h) = 1.55h + 938.70$

C. $C(h) = -1.55h + 1264.20$

D. $C(h) = 5.24h$

E. None of the above.

---

8. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 27 liter 31 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 16 percent and 40 percent solutions, what was the amount she used of the 40 percent solution?

A. $10.12 liters$

B. $13.50 liters$

C. $16.88 liters$

D. $15.73 liters$

E. There is not enough information to solve the problem.

---

9. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 3 many cases reported, but the number of confirmed cases has quadrupled every 4 days. How long will it be until there are at least 1000000 confirmed cases?

A. About 51 days

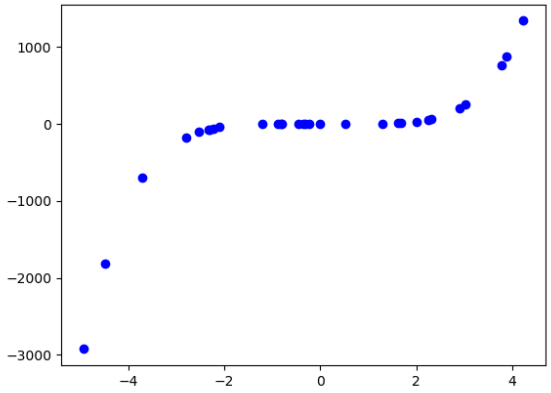
B. About 23 days

C. About 37 days

D. About 27 days

E. There is not enough information to solve the problem.

10. Determine the appropriate model for the graph of points below.



A. Non-linear Power model

B. Linear model

C. Logarithmic model

D. Exponential model

E. None of the above

11. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 33 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

A. About 15 percent

B. About 10 percent

C. About 11 percent

D. About 16 percent

E. None of the above

12. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 4 many cases reported, but the number of confirmed cases has doubled every 1 days. How long will it be until there are at least 10000 confirmed cases?

A. About 4 days

B. About 5 days

C. About 12 days

D. About 8 days

E. There is not enough information to solve the problem.

13. The temperature of an object, T, in a different surrounding temperature T_s will behave according to the formula $T(t) = Ae^{kt} + T_s$, where t is minutes, A is a constant, and k is a constant. Use this formula and the situation below to construct a model that describes the uranium's temperature, T, based on the amount of time t (in minutes) that have passed. Choose the correct constant k from the options below.

Uranium is taken out of the reactor with a temperature of 120° *C and is placed into a* 13° *C bath to cool. After 18 minutes, the uranium has cooled to* 60° *C.*

A. $k = -0.03696$

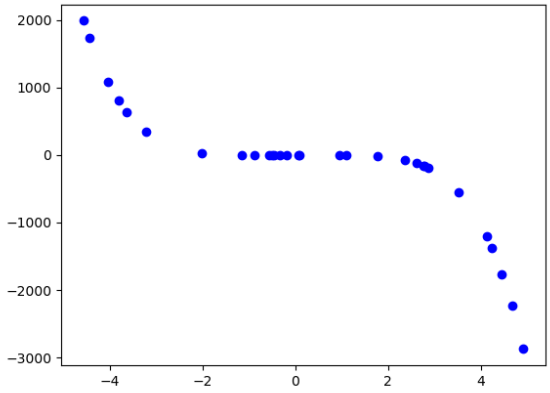
B. $k = -0.05207$

C. $k = -0.04570$

D. $k = -0.03771$

E. None of the above

14. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Logarithmic model

C. Linear model

D. Non-linear Power model

E. None of the above

---

15. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 49 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

A. About 22 percent

B. About 24 percent

C. About 4 percent

D. About 14 percent

E. None of the above

---

16. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 29 liter 23 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 17 percent and 33 percent solutions, what was the amount she used of the 17 percent solution?

A. $14.50 liters$

B. $13.10 liters$

C. $10.88 liters$

D. $18.12 liters$

E. There is not enough information to solve the problem.

---

17. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$ to find the coefficient for the model of the new volume $V_{\text{new}} = kr^2 h$.

Pepsi wants to increase the volume of soda in their cans. They've decided to decrease the radius by 20 percent and increase the height by 16 percent. They want to model the new volume based on the radius and height of the original cans.

A. $k = 0.74240$

B. $k = 2.33232$

C. $k = 0.02011$

D. $k = 0.00640$

E. None of the above.

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18. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 28 liter 22 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 5

percent and 34 percent solutions, what was the amount she used of the 34 percent solution?

A. $12.23 liters$

B. $14.00 liters$

C. $16.41 liters$

D. $11.59 liters$

E. There is not enough information to solve the problem.

---

19. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 6 many cases reported, but the number of confirmed cases has tripled every 2 days. How long will it be until there are at least 100000 confirmed cases?

A. About 8 days

B. About 20 days

C. About 18 days

D. About 9 days

E. There is not enough information to solve the problem.

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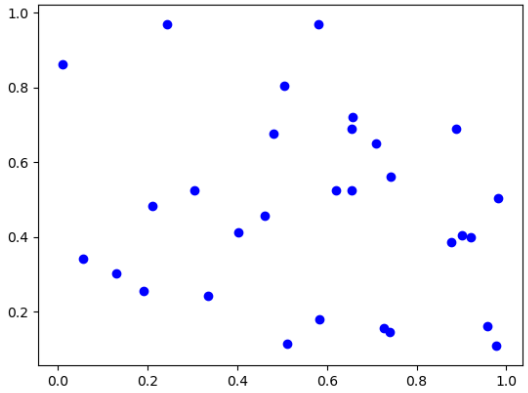
20. Determine the appropriate model for the graph of points below.



A. Exponential model

B. Linear model

C. Logarithmic model

D. Non-linear Power model

E. None of the above

---

21. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 42 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

A. About 21 percent

B. About 12 percent

C. About 19 percent

D. About 3 percent

E. None of the above

---

22. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 5 many cases reported, but the number of confirmed cases has quadrupled every 2 days. How long will it be until there are at least 100000 confirmed cases?

A. About 8 days

B. About 15 days

C. About 9 days

D. About 20 days

E. There is not enough information to solve the problem.

23.

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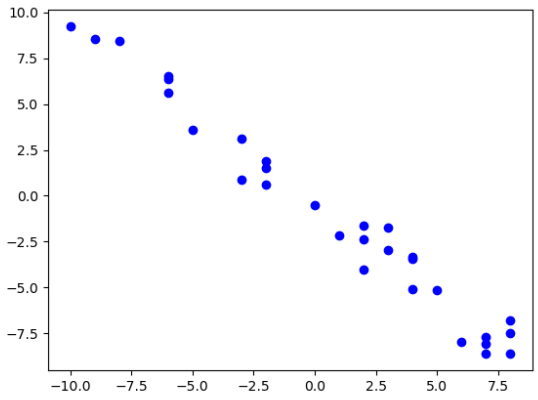
24. Determine the appropriate model for the graph of points below.



A. Logarithmic model

B. Linear model

C. Non-linear Power model

D. Exponential model

E. None of the above

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25. For the scenario below, use the model for the volume of a cylinder as $V = \pi r^2 h$.

Pringles wants to add 47 percent more chips to their cylinder cans and minimize the design change of their cans. They've decided that the best way to minimize the design change is to increase the radius and height by the same percentage. What should this increase be?

A. About 24 percent

B. About 21 percent

C. About 14 percent

D. About 4 percent

E. None of the above

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26. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 30 liter 9 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 5 percent and 33 percent solutions, what was the amount she used of the 33 percent solution?

A. $15.00 liters$

B. $4.29 liters$

C. $16.92 liters$

D. $25.71 liters$

E. There is not enough information to solve the problem.

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27. Using the scenario below, model the population of bacteria α in terms of the number of minutes, t that pass. Then, choose the correct approximate *(rounded to the nearest minute)* replication rate of bacteria-α.

A newly discovered bacteria, α, is being examined in a lab. The lab

started with a petri dish of 3 bacteria-α. After 1 hours, the petri dish has 105 bacteria-α. Based on similar bacteria, the lab believes bacteria-α quadruples after some undetermined number of minutes.

A. About 70 minutes

B. About 138 minutes

C. About 23 minutes

D. About 11 minutes

E. None of the above

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28. Solve the modeling problem below, if possible.

In CHM2045L, Brittany created a 28 liter 25 percent solution of chemical χ using two different solution percentages of chemical χ. When she went to write her lab report, she realized she forgot to write the amount of each solution she used! If she remembers she used 17 percent and 32 percent solutions, what was the amount she used of the 32 percent solution?

A. $14.93 liters$

B. $13.70 liters$

C. $13.07 liters$

D. $14.00 liters$

E. There is not enough information to solve the problem.

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29. Solve the modeling problem below, if possible.

A new virus is spreading throughout the world. There were initially 8 many cases reported, but the number of confirmed cases has quadrupled every 5 days. How long will it be until there are at least 10000 confirmed cases?

A. About 36 days

B. About 26 days

C. About 15 days

D. About 14 days

E. There is not enough information to solve the problem.

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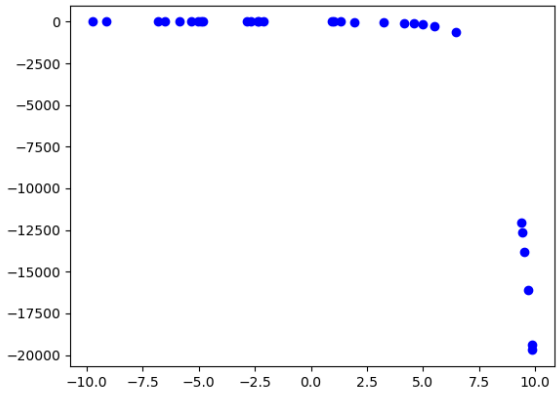
30. Determine the appropriate model for the graph of points below.



A. Linear model

B. Logarithmic model

C. Exponential model

D. Non-linear Power model

E. None of the above
